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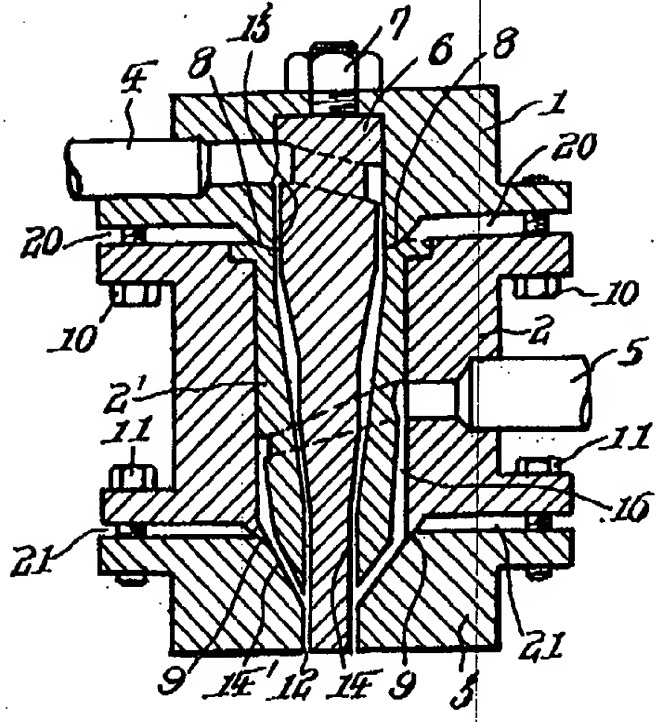
第1図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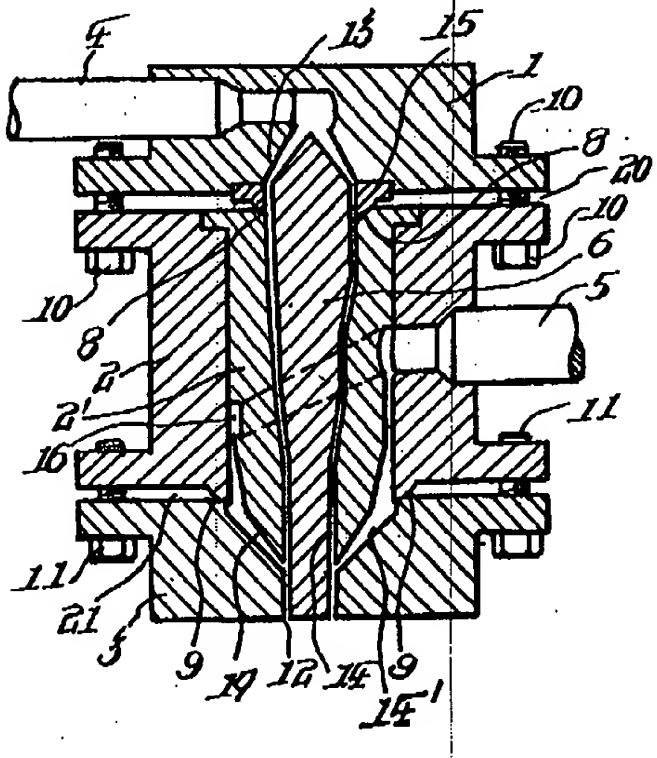
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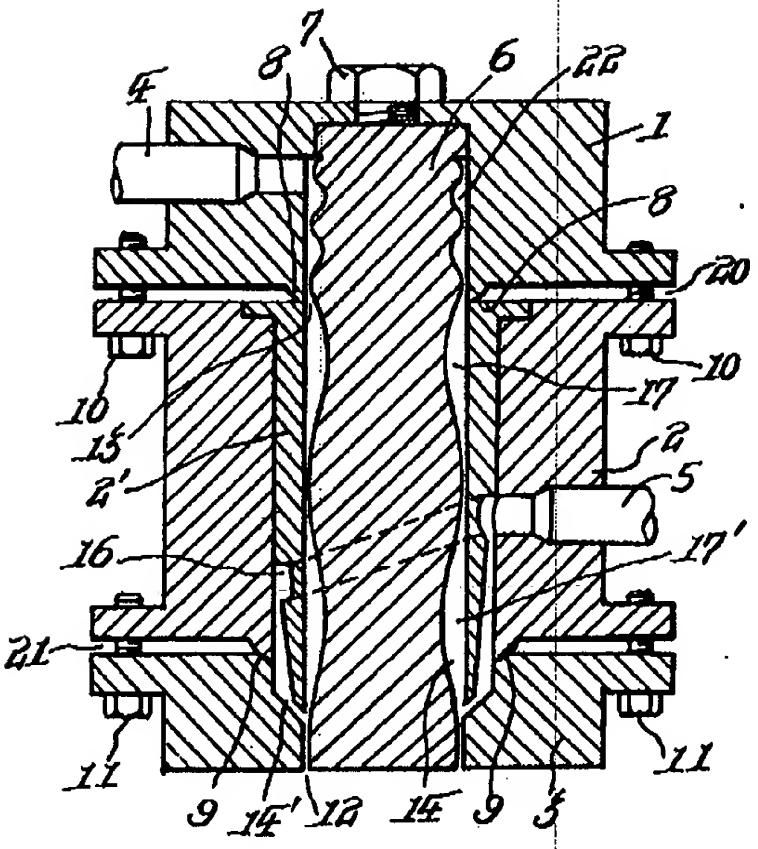
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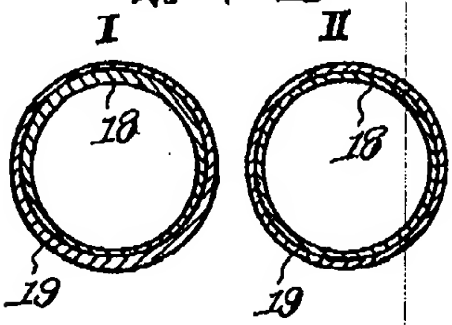
第 4 図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⑤2日本分類 25(5) E 32
⑲日本国特許庁
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1

⑤4積層中空組合わせダイ

審判 昭49－7073
㉑特願 昭44－86876
㉒出願 昭44(1969)10月31日

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図面の簡単な説明

第1～3図はそれぞれ異なる実施例によるこの発明の積層中空組合わせダイの側断面図、第4図はこの発明の装置で作られる積層樹脂管の断面図である。

発明の詳細な説明

一般に熱可塑性合成樹脂の異質のものを積層して種々の特徴を併有した新しい優れたフイルム、シート、中空成形体を得る試みは古くから行われており、従来これらについて、たとえば樹脂の組合わせの面で、または組合わせのための樹脂組成の面で、または積層用接着剤の面で多くの発明考案がなされている。この種積層中空ダイに関し、もつとも基本的で古いものに特公昭28－3837号に示されたロベルト・コロンボの装置があり、このあと特公昭32－8090号、特公昭34－2241号、特公昭38－15072号、特公昭39－1525号、特公昭39－26290号、特公昭41－13628号と積層ダイについて多くの発明が開示されているが、これらにはいずれも積層される二層の樹脂膜の厚味を調整し、矯正

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することについて言及するところはない。即ち一層を成す樹脂膜の厚味はそのダイに穿設された樹脂脂の通路によつて定まり、又之と積層される他の樹脂膜の厚味もダイに穿設された樹脂通路によつて規制されるものである。

しかしながら極めて薄い、例えば0.1～2.0㎜の樹脂通路を均整にダイ内に穿設することは至難のことであり、またたとえ穿設が正確に行われ得たとしても、ダイ内を通る樹脂に押出圧を均整に作用させることもまた至難のことでダイを経て成形された二層の樹脂管の断面内に厚薄の肉むらが生じることを防ぐことはできなかつた。

この発明は、二層から成るインフレーションフイルム、および中空吹込成形品を製造するために別個に溶融された二種の熱可塑性樹脂を二層のパリソンに形成して押出す積層中空組合わせダイに係るものであつて、異質の樹脂をそれぞれ溶融する押出機と気密に結合した二つの樹脂導入口を有し、それぞれの樹脂を管状に形成し、積層させる3箇のダイを組合わせて、それぞれの管状樹脂の厚味を均整化するように調整し、矯正する機能を持たせたもので、内層となる樹脂の溶融押出機の押出孔またはその導管に気密に連結され、中ダイおよび下ダイと共通のマンドレルを固定し、内層樹脂を中空間に成形する上ダイと、外層となる樹脂の溶融押出機の押出孔またはその導管に気密に連結され、上記マンドレルとの間に内層樹脂の環状通路を有し、かつその周囲に外層樹脂の通る外側間隙を中ダイ本体との間に有する内殻を一体に結合した中ダイ、および中ダイの下方に位置して前記両層を重ねて積層中空管に成形する下ダイとが組合わされてそれぞれダイの周縁に設けた3ケ以上のボルト孔およびボルトなどの調節可能な結合装置で結合され、上ダイと中ダイ、および中ダイと下ダイの環状樹脂通路の外周縁に設ける気密接合部をそれぞれ一方が凸形、他方が凹形の同一半径の球面から成る球面接合部としたことを特徴

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とするものである。

図についてこの発明の実施例を説明すると、第1図において1は内層となる樹脂の図示しない溶融押出機の押出孔と樹脂取入口とを導管4によつて気密に結合し、中ダイ2および下ダイ3と共通のマンドレル6をマンドレル固定ネジ7によつて固定して一体に固設し、内層樹脂をマンドレル6の周囲間隙13を通過させて中空管に成形する上ダイである。

2は外層となる樹脂の図示しない溶融押出機の押出孔と樹脂取入口とを導管5によつて気密に連結した中ダイで、その内面に内殻2'が一体的に結合されている。

内殻2'は上部に上ダイ1と球面で接合する気密接合部8を有し、内面と上記マンドレル6との間に、前記上ダイ1の環状間隙13に連なる内側環状通路14を形成し、また下部外周面と中ダイ本体2の内面との間には前記導管5からの外層樹脂の外側環状間隙16が形成されている。外層樹脂は中ダイ本体2と内殻2'の外周面との間の上記外側環状間隙16を通過して管状体となり、次いで後記下ダイ3と内殻2'の外周面との間の接合環状通路14'を通つて、内殻2'の内面とマンドレル6との間の環状通路14を管状で流下する内層樹脂と、内殻2'の末端部を越えた地点で接合し、両者は積層管となつてスリット12から押出される。

上記下ダイ3は、マンドレル6と中ダイの内殻2'の内面との間の前記内側環状通路14を通して押出される内層樹脂中空管と、中ダイの内殻2'の外周面と下ダイ内面との間の前記接合環状通路14'を押出される外層樹脂中空管とを、内殻2'の下端縁を越えたマンドレル下端部と下ダイ3の内面との間で積層管に形成するものである。

上ダイ1と中ダイ2との結合は、上ダイ1に固定されたマンドレル6を中ダイ2の内部空間に通して中ダイ2を上ダイ1に近接させ、両者をそれぞれの環状樹脂通路の外周に形成された一方が凸形、他方が凹形の同一半径の球面から成る気密接合部8で接触させて、マンドレル6の周囲の内側環状通路14が均整となるように、ダイの周縁に少くとも3箇所以上の等間隔に設けられたボルト孔とボルト10のような調節可能な結合装置によつて調節可能に結合する。同様に中ダイ2と下ダイ3の結合は、中ダイ2と下ダイ3の上記同様の

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球面から成る気密接合部9を接触させたのち、マンドレル6の下端の周囲にスリット12が均整となるように、ダイ周縁に少くとも3箇以上の等間隔に設けられたボルト孔およびボルト11のような調節可能な結合装置によつて行う。そして上ダイ1に固定されたマンドレル6の下端面と下ダイ3の下面は同一又は略同一面におかれるようにする。

ここで3箇またはそれ以上のボルト10相互の緊締度のバランスを変えると、接合部8を軸として中ダイ2の上ダイ1に対する結合角度が変わり、マンドレル6と中ダイ間に形成される内側環状通路14の形が調整される。ボルト11相互の緊締度のバランスを変えると接合部9を軸として下ダイ3の中ダイ2に対する結合角度が変り、スリット12の形と中ダイと下ダイとの間に形成される間隙部14'の形が同時に変る。それぞれの接合部8，9は前述したようにスライドできる球面に成つているために、この角度の変更によつて気密性が破壊され溶融樹脂が外部に漏出するおそれはない。そして、この接合角度の変更は樹脂の流れに微妙に干渉し変化させる。従つてこの機構はこの組合わせダイのスリット部12から押出される積層中空管の各層の樹脂の偏肉を是正するため効果的に利用することができるものである。したがつて、上ダイ1と中ダイ2および中ダイ2と下ダイ3の間にはそれぞれボルト10およびボルト11によつて各球面接合部8，9を軸として各ダイの結合角度を変えられるだけの空隙20，21が保たれる。

なお、内層樹脂押出機と気密に接合された上ダイ1と、外層樹脂押出機と気密に結合された中ダイ2を気密接合部8でスライドさせて2つのダイ1，2の結合角を変えるために生じる押出機とダイとの間の歪みは、各押出孔と各ダイの樹脂取入口とを導管4，5を用いて連結し、導管に歪みを吸収させることが好ましい。

第2図に示す実施例においてはマンドレル6が上ダイ1の中央空間部の周壁とスパイダー部15において固定されており、第3図に示す実施例においては、マンドレル6は上端のスパイラル部22と下端の押出スリット12との中間二つのゆるやかな曲面で形成された縮小部分17，17'が形成され、押出スリット12はこれらの延長線内

に形成されたものであつて、その他の　成は第1図のものと同様である。

この発明の装置により、たとえば、上ダイ1を導管4によつてポリエチレンの溶融押出機の押出孔に連結し、中ダイ2を導管5によつて塩化ビニリデン－塩化ビニル共重合体の溶融押出機の押出孔に連結し各ボルト10，11の一応の調整を行つて積層樹脂管の押出しを行い、成形された樹脂管の断面を検査して、ポリエチレンの内層18と塩化ビニリデン－塩化ビニル共重合体の外層19とが第4図Ⅰのようにポリエチレンの内層18が一方に厚く一方に薄い偏肉状で、外層はこれと逆の偏肉状態であり、積層管全体としては均等な厚みに形成されている場合、まず中ダイ2の取付けボルト10について、内層18の偏肉の厚い側のボルトをゆるめ他側のボルトを増締めすると、マンドレルに対する中ダイの関係が相対的に変化してマンドレルは幾分厚肉側に移動し、間隙14の形が修正される。この状態では中ダイと下ダイとの結合が不安定なのでスリット12が片寄ることになるので、ボルト11についてボルト10と逆側の調整を行うことによりスリット12はマンドレル6の下端部の回りに均等の間隙を形成すると同時に外層を形成する中ダイ2と下ダイ3との間隙14'も前の逆の調整が行われた結果となる。

このような微調整をくり返すことにより、第4図Ⅱのような均一な厚みの断面を持つ積層管を得ることができる。

この発明は上記のようにきわめて簡単な構成と操作とによつて、積層体内の肉厚の均正を容易正確に確保できる有用な発明である。

㊀特許請求の範囲

1　内外二層の積層管状樹脂製品の成形のため、上中下3つのダイ1，2，3が故上ダイ1に一端を固定されている共通のマンドレル6を中心に重合されていて、上ダイ1は内層となる溶融樹脂の導管4に連結されて上記マンドレル6との間に内層となる樹脂が通過する環状間隙13を形成し、中ダイ2と一体の中空内設部2'と前記マンドレル6との間に上記環状間隙に連通する内側環状通路14を形成すると共に外層となる溶融樹脂の導管5に連結される中ダイ2の内面と上記中空内設部2'の外周面との間に外層となる樹脂が通過する外側環状間隙16を形成し、下ダイ3は上記中空内設部2'の延長端との間に上記外側環状間隙16に連通する外側環状通路14'を形成すると共にその内面と前記マンドレル6先端部周面との間に上記内側環状通路14'の樹脂を重ねて管状に押出す押出しスリット12を備え、前記上ダイ1と中ダイ2および中ダイ2と下ダイ3とは、それぞれの重合部における環状間隙の外周に形成される球面接合部8および9によつて気密に接合すると共に該重合部にそれぞれ設けられる調節用空隙20および21にそれぞれ3個以上の調節可能な結合装置10および11を設けたことを特徴とする積層中空組合わせダイ。

(19) Patent Office of Japan (JP)

Gazette of Examined Patent Applications

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(44) Date of Publication: August 20, 1976

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Number of claims: 1

(Total of 5 pages)

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(54) Title of the Invention: HOLLOW COMBINATION LAMINATING DIE

Trial No.: Showa 49-7073

(21) Patent Application [Tokugan] No.: Showa 44-86,876

(22) Application Date: October 31, 1969

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Brief Description of the Diagrams

Figs. 1-3 are cross-sectional side views of different embodiments of hollow combination laminating dies according to the invention, and Fig. 4 is a cross-sectional view of a laminated resin tube produced with the invented apparatus.

Detailed Description of the Invention

Attempts have long been made to obtain new and excellent films, sheets and hollow formed bodies having various features by laminating thermoplastic plastics which generally have different properties. There have been numerous inventions which approach this, for example, from the

standpoint of the combination of resins, the compositions of the resins to be combined, or the laminating adhesives. The oldest and most basic [invention] made concerning this type of hollow laminating die is the Robert Colombo* apparatus cited in Japanese Examined Patent Publication [Kokoku] No. 28-3837 (1953). This was followed by the disclosure of numerous inventions on laminating dies, in Kokoku No. 32-8090 (1957), 34-2241 (1959), 38-15,072 (1963), 39-1525 (1964), 39-26,290 (1964) and 41-13,628 (1966). But these refer only to adjustments and corrections in the thicknesses of the two resin films that are laminated. That is, the thickness of the resin film forming one layer is determined by a resin flow channel that has been formed in the die, and the thickness of the other resin film laminated with this is also regulated by a resin flow channel that has been formed in the die.

However, it is extremely difficult to uniformly form within the die very thin (e.g., 0.1–2.0 mm) resin flow channels, and even if one is able to accurately carry out such formation, it is very difficult as well to have the extrusion pressure act uniformly upon the resin passing through the die. Hence, it has been impossible to prevent irregularities from arising in the cross-sectional wall thicknesses of two-layer resin pipes formed by means of dies.

The present invention relates to a hollow combination laminating die that forms two separately melted thermoplastic resins into a two-layer parison in order to produce blown films and hollow blow-molded articles composed of two layers. It has two resin intakes which are airtightly connected to extruders that respectively melt the different resins, combines three dies which form the respective resins into tubular forms and laminate them, and has been provided with functions which adjust and correct the thicknesses of the respective tubular resins so as to make them uniform. Combined within this [apparatus] is a top die that is airtightly coupled to the extrusion orifice or its line in the melt extruder for the resin that becomes the inner layer, attaches to a common mandrel with the middle die and bottom die, and forms the inner-layer resin in the hollow space; a middle die that is airtightly coupled to the extrusion orifice or its line in the melt extruder for the resin that becomes the outer layer, has an inner-layer resin annular flow channel between it and the mandrel, and is integrally joined at the periphery thereof the outside gap through which the outer-layer resin passes with the inner shell between this and the main body of the middle die; and a bottom die which is positioned below the middle die and which places the two [resin] layers on top of one another and forms them into a laminated hollow tube; these being fastened together by adjustable fastening devices, such as three or more bolt holes and bolts, etc., provided at the peripheral edges of each die, and airtight junctions provided at the outer peripheral edges of the annular resin flow channels in the top die and the middle die, and in the middle die and the bottom die, respectively form spherical junctions composed of spherical surfaces having the same radius, one of which is convex and the other of which is concave.

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* Name is transliterated from Japanese transliteration. Actual English spelling may differ.—*The Language Service.*

Embodiments of the invention are illustrated in the diagrams. In Fig. 1, 1 is a top die which is airtightly connected by means of a line 4 with the extrusion orifice and the resin intake of a melt extruder (not shown) for the resin which becomes the inner layer, is integrally attached by means of a mandrel-securing screw 7 together with a mandrel 6 that is common with a middle die 2 and a bottom die 3, and molds the inner-layer resin into a hollow tube by passing it through a peripheral gap 13 in the mandrel 6.

Next, 2 is a middle die that is airtightly connected by means of a line 5 to the extrusion orifice and the resin intake of a melt extruder (not shown) for the resin which becomes the outer layer.

An inner shell 2' has at the top an airtight junction 8 that joins with the top die 1 at a spherical surface, forms between the inner face thereof and the mandrel 6 an inner annular flow channel 14 which is connected to the annular gap 13 in the top die 1, and forms, between the bottom outer peripheral face and the inner face of the middle die main body 2, an outer annular gap 16 for the outer layer resin from line 5. The outer-layer resin passes through the outer annular gap 16 between the middle die main body 2 and the outer peripheral face of the inner shell 2', becoming a tubular body, following which it passes through the uniting annular flow channel 14' between the bottom die 3 described below and the outer peripheral face of the inner shell 2', and unites at a point beyond the end of the inner shell 2' with the inner-layer resin which flows down in tubular form through the annular flow channel 14 between the inner face of the inner shell 2' and the mandrel 6, whereupon the two resins become a laminated tube, which is extruded from the slit 12.

The bottom die 3 forms the inner-layer resin hollow tube extruded through inner annular flow channel 14 between the mandrel 6 and the inner face of the inner shell 2' of the middle die, and the outer-layer hollow tube extruded through the uniting annular flow channel 14' between the outer peripheral face of the inner shell 2' of the middle die and the inner face of the bottom die, into a laminated tube between the bottom end of the mandrel beyond the bottom edge of inner shell 2' and the inner face of the bottom die 3.

Top die 1 and middle die 2 are fastened together by adjustable fastening devices such as three or more bolt holes and bolts 10 that are equally spaced on the peripheral edges of the dies, the mandrel 6 attached to the top die 1 being passed through the inner space in the middle die 2 and the middle die 2 being brought into close proximity with the top die 1, with both being brought into contact at an airtight junction 8 comprising spherical surfaces having the same radii, one of which is convex and the other of which is concave, that have been formed on the outer peripheries of the respective spherical resin flow channels, such that the inside annular flow channel 14 at the periphery of the mandrel 6 becomes uniform. Similarly, the middle die 2 and the bottom die 3 are fastened together by means of adjustable fastening devices such as three or more bolt holes and bolts 11 that are equally spaced on the peripheral edges of the dies, this being done by contacting an airtight junction 9 composed of spherical surfaces like those described above in the middle die 2 and the bottom die 3, then making the slit 12 at the periphery on the bottom end of the mandrel 6

uniform. The bottom face of the mandrel 6 secured to the top die 1 and the bottom face of the bottom die 3 are made so as to lie on the same or approximately the same plane.

When the balance in the degree of tightening between the three or more bolts 10 is changed, this effects a change in the fastening angle of the middle die 2 to the top die 1, with respect to junction 8 as the axis, thereby adjusting the shape of the inside annular flow channel 14 formed between the mandrel 6 and the middle die. When the balance in the degree of tightening between the bolts 11 is changed, this effects a change in the fastening angle of the bottom die 3 to the middle die 2, with respect to junction 9 as the axis, in addition to which the shape of the slit 12 as well as the shape of the gap 14' that forms between the middle die and the bottom die changes at the same time. Because the respective junctions 8 and 9 form spherical faces that can slide in the manner described above, there is no danger of the airtightness being destroyed by changes in these angles and resulting in leakage of the molten resin to the exterior. Moreover, changes in these fastening angles subtly interfere with resin flow, causing it to change. This mechanism can thus be effectively used to correct the biases in the thickness of each layer of resin in the laminated hollow tube extruded from the slit portion 12 of this combination die. Hence, by means of the respective [sets of] bolts 10 and 11, gaps 20 and 21, which are just large enough to be able to change the fastening angles for each die, with respect to the respective spherical junctions 8 and 9 as the axes, are maintained between top die 1 and middle die 2 and between middle die 2 and bottom die 3.

It is desirable that the strains between the extruders and the dies, which arise because the fastening angle between the two dies 1 and 2 changes when the top die 1 which has been airtightly joined with the inner-layer resin extruder and the middle die 2 which has been airtightly joined with the outer-layer resin extruder are made to slide at the airtight junction 8, be absorbed by the lines 4 and 5 which are used to connect the respective extrusion orifices with the resin intakes of the respective dies.

In the embodiment shown in Fig. 2, the mandrel 6 is attached at the peripheral wall of the central space in top die 1 and at a spider 15. In the embodiment shown in Fig. 3, there are formed in the mandrel 6 two intermediate areas of reduced [cross-section] 17 and 17' in the form of gradual curved surfaces between a spiral portion 22 at the top end and an extrusion slit 12 at the bottom end. The extrusion slit 12 has been formed within the linear extension of these. The rest of the structure is the same as that in Fig. 1.

In a case where, using the apparatus of this invention, the top die 1 is connected by means of a line 4 to the extrusion orifice of a polyethylene melt extruder, the middle die 2 is connected by means of a line 5 to the extrusion orifice of a vinylidene chloride-vinyl chloride copolymer melt extruder, approximate adjustment of the respective bolts 10 and 11 is effected and the extrusion of a laminated resin tube is carried out, let us assume that, upon examining the cross-section of the resin tube thus formed, the polyethylene inner layer 18 and the vinylidene chloride-vinyl chloride copolymer outer layer 19 are found to be as shown in Fig. 4 (I); that is, the polyethylene inner

layer 18 is of uneven thickness with one side being thick and the other side being thin, while the outer layer has an uneven thickness which complements this, such that the laminated tube overall has been formed with a uniform wall thickness. In a case such as this, if the middle die 2 fastening bolts 10 are first adjusted by loosening the bolt on the side where the wall thickness of the inner layer 18 is too large and tightening the other bolts, the relationship of the middle die to the mandrel undergoes a relative change, with the mandrel shifting somewhat toward the thick-walled side, thereby correcting the shape of the gap 14. Because no change occurs in the coupling between the middle die and the bottom die in this state, the slit 12 moves to one side. If adjustments are then made to the bolts 11 on the side opposite to the adjustments made in the bolts 10, the slit 12 forms a uniform gap around the lower end of the mandrel 6; at the same time, the gap 14' between middle die 2 and bottom die 3 that forms the outer layer is adjusted in the opposite manner to the first adjustment.

By repeating fine adjustments such as this, a laminated tube having a cross-section of uniform thickness like that shown in Fig 4 (II) can be obtained.

The present invention is useful because, as indicated above, it is able, by means of a very simple construction and operation, to easily and accurately assure the proper uniformity of wall thickness in a laminate.

(57) Claim

1 A hollow combination laminating die for forming two-layer laminated tubular resin products having an outer and an inner layer, in which three dies, a top, middle and bottom die 1, 2, 3, are disposed with a common mandrel 6, one end of which is attached to said top die 1 situated at the center, wherein said top die 1 is coupled to a line 4 for the molten resin that becomes the inner layer and forms an annular gap 13 with said mandrel 6 through which flows the resin that becomes the inner layer, there is formed between hollow inner shell 2' that is integral with middle die 2 and said mandrel 6 an inner annular flow channel 14 that communicates with said annular gap and there is formed between the inner face of middle die 2 which is coupled to a line 5 for the molten resin that becomes the outer layer and the outer peripheral face of said hollow inner shell 2' an outside annular gap 16 through which passes the resin that becomes the outer layer, and a bottom die 3 forms between it and said hollow inner shell 2' an outside annular flow channel 14' that communicates with said outside annular gap 16 and also provides between the inner face thereof and the leading peripheral face of said mandrel 6 an extrusion slit 12 which laminates the resin from said inside annular flow channel 14' and extrudes it in a tubular form, and moreover where said top die 1 and middle die 2 and said middle die 2 and bottom die 3 are airtightly joined by means of spherical junctions 8 and 9 that are formed at the outer peripheries of the annular gaps at the respective places where these dies meet, and three or more adjustable fastening devices 10 and 11 are provided on each of the adjusting gaps 20 and 21 respectively provided at said places.

Fig. 1

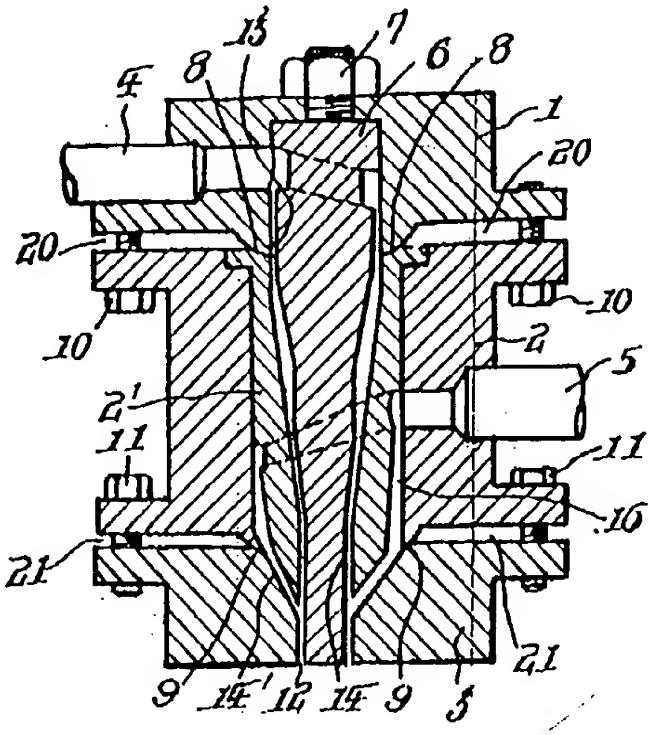
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Fig. 2

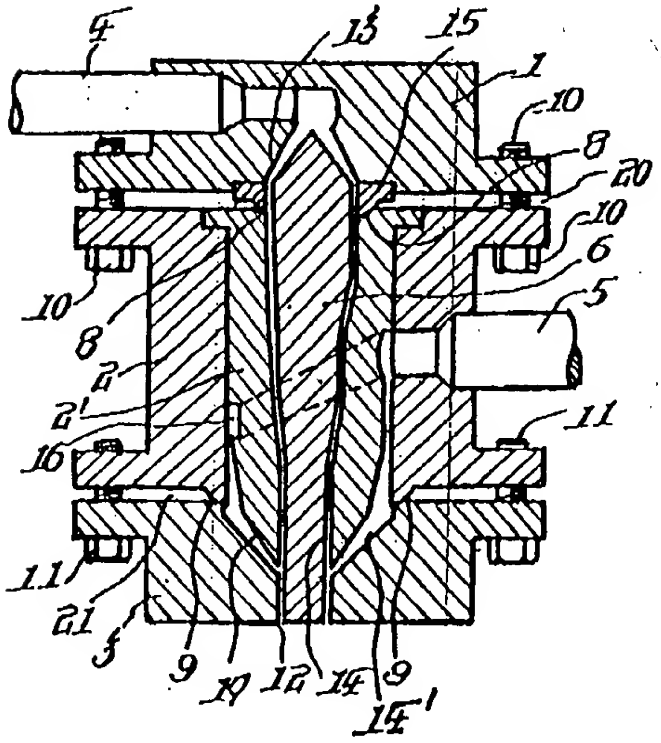
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Fig. 3

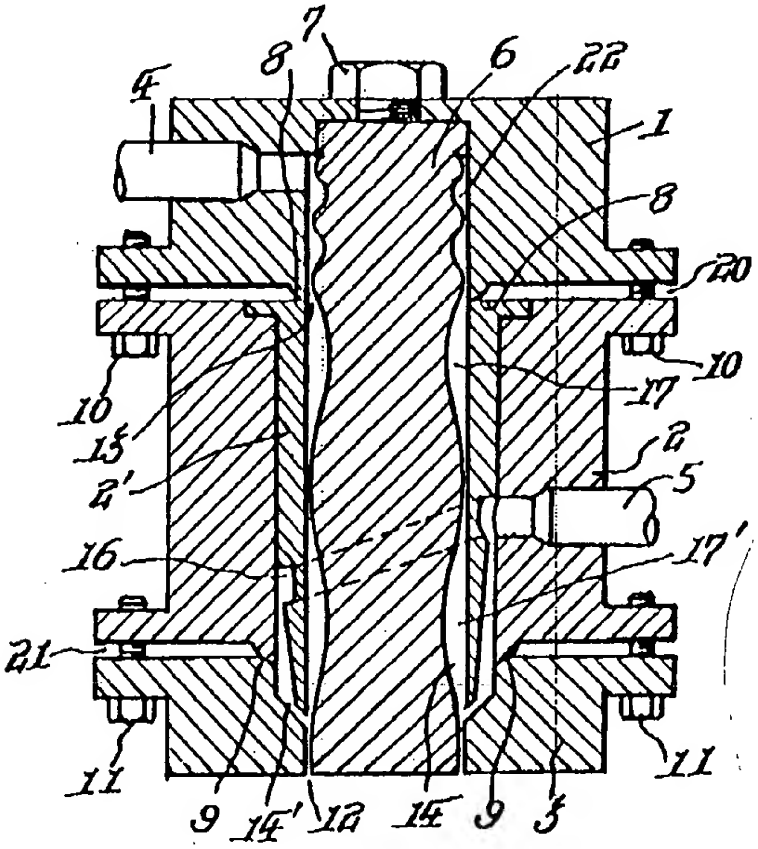
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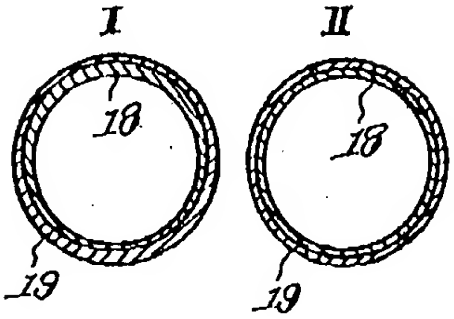
Fig. 4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CERTIFICATE OF ACCURACY

State of New York
) ss.
County of Dutchess

On this day personally appeared before me Jeanne De Tar, Assistant Director of The Language Service, Inc., translation bureau at 806 Main Street, Poughkeepsie, NY, 12603; who after being duly sworn deposes and states:

That the attached translation was prepared by Frederic Metreaud, professional translator of the Japanese and English languages,

That the said translator is thoroughly familiar with both languages,

That he has carefully prepared the attached translation of Japanese Examined Patent Application Publication [Kokuku] No.: Showa 51-28668, regarding a hollow combination laminating die, from the original document submitted to him in the Japanese language;

and that the said translation is a true, complete, and correct English version of such original to the best of her knowledge and belief.

Jeanne De Tar

Janet M Cook

Sworn to before me on this
13th day of May, 1997
Poughkeepsie, New York

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